

IN THE  
UNITED STATES PATENT AND TRADEMARK OFFICE

*JPW*

Inventor(s): Venkatesh Krishnan et al.

Confirmation No.: 8205

Application No.: 09/350,492

Examiner: Tang K.

Filing Date: 7-9-99

Group Art Unit: 2127

Title: TWO TIER ARRANGEMENT FOR THREADS SUPPORT IN A VIRTUAL MACHINE

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TRANSMITTAL OF APPEAL BRIEF

Sir:

Transmitted herewith in **triplicate** is the Appeal Brief in this application with respect to the Notice of Appeal filed on 4-20-04.

The fee for filing this Appeal Brief is (37 CFR 1.17(c)) \$330.00.

(complete (a) or (b) as applicable)

The proceedings herein are for a patent application and the provisions of 37 CFR 1.136(a) apply.

(X) (a) Applicant petitions for an extension of time under 37 CFR 1.136 (fees: 37 CFR 1.17(a)-(d) for the total number of months checked below:

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( ) The extension fee has already been filled in this application.

( ) (b) Applicant believes that no extension of time is required. However, this conditional petition is being made to provide for the possibility that applicant has inadvertently overlooked the need for a petition and fee for extension of time.

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Respectfully submitted,

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In Re Application of:

Venkatesh Krishnan et al.

Application No: 09/350,492

Filed: 7-9-99

For: TWO TIER ARRANGEMENT FOR  
THREADS SUPPORT IN A  
VIRTUAL MACHINE

Examiner: Tang K.

Art Unit: 2127

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**Appellant's Brief (Pursuant to 37 C.F.R. §1.192)**

Dear Sir:

Applicant/ Appellant submits this Appeal Brief in connection with the  
above-referenced patent application which is on appeal to the Board of Patent  
Appeals and Interferences.

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### **REAL PARTY IN INTEREST**

The real party in interest in this application is Hewlett-Packard Development Company, L.P.

### **RELATED APPEALS AND INTERFERENCES**

Appellant is unaware of any other related appeals or interferences that may directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

### **STATUS OF THE CLAIMS**

Claims 30-35 and 47-52 stand rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent Application Publication US 2001/0049686 of *Nelson et al.* ("*Nelson*") and U.S. Patent no. 6,314,445 B1 of *Poole* ("*Poole*").

Claims 36 and 38-42 stand rejected under 35 U.S.C. §103(a) as being unpatentable over *Nelson* and *Poole* and U.S. Patent no. 3,858,182 of *Delagi et al.* ("*Delagi*").

Claim 37 stands rejected under 35 U.S.C. §103(a) as being unpatentable over *Nelson* and *Poole* and U.S. Patent no. 5,421,014 of *Bucher* ("*Bucher*").

Claims 43-46 stand rejected under 35 U.S.C. §103(a) as being unpatentable over *Nelson* and *Poole* and U.S. Patent no. 5,630,128 of *Farrell et al.* ("*Farrell*").

Appellant appeals the rejection of all of the pending claims 30-52. Claims 30-52 as currently pending are set forth in the attached Appendix.

### **STATUS OF AMENDMENTS**

Appellant is unaware of any amendments filed after the Final Office Action mailed January 20, 2004 which finally rejected claims 30-52.

### **SUMMARY OF THE INVENTION**

Claims 30-52 are directed to a virtual machine having a two tier arrangement for threads support that enhances the adaptability of the virtual machine to different underlying operating system and hardware platforms. (Page 4, lines 3-6 of Appellant's Specification). A two tier arrangement for threads support in a virtual machine according to claims 30-52 includes a threads interface layer and a native threads interface layer. (Page 4, lines 6-9 of Appellant's Specification). The threads interface layer provides a standard threads interface for a set of threads associated with an application program executed by a virtual machine such that the standard threads interface does not depend on an underlying platform of the virtual machine while the native threads interface layer adapts the threads interface layer to the underlying platform. (Page 4, lines 9-15 of Appellant's Specification).

### **ISSUES PRESENTED**

- I: Whether claims 30-35 and 47-52 are obvious in view of *Nelson and Poole*.**
- II: Whether claims 36 and 38-42 are obvious in view of *Nelson and Poole and Delagi*.**
- III: Whether claim 37 is obvious in view of *Nelson and Poole and Bucher*.**
- IV: Whether claims 43-46 are obvious in view of *Nelson and Poole and Farrell*.**

### **GROUPING OF CLAIMS**

Claims 30-52 stand together (Group I).

## ARGUMENT

### **I: Claims 30-35 and 47-52 are not obvious in view of *Nelson* and *Poole* because *Nelson* and *Poole* do not disclose or suggest the limitations of claims 30 and 47.**

Appellant respectfully submits that claims 30 and 47, and claims 31-35 and 48-52 which depend from claims 30 and 47, are not obvious in view of *Nelson* and *Poole* because *Nelson* and *Poole* do not disclose or suggest a virtual machine having a two-tier<sup>1</sup> arrangement for threads support as claimed in claims 30 and 47. *Nelson* and *Poole* do not disclose or suggest a threads interface layer that provides a standard threads interface for a set of threads associated with an application program executed by a virtual machine such that the standard threads interface does not depend on an underlying platform of the virtual machine as claimed in claims 30 and 47. Furthermore, *Nelson* and *Poole* do not disclose or suggest a native threads interface layer that adapts the threads interface layer to the underlying platform as claimed in claims 30 and 47.

### **A. *Nelson* and *Poole* do not disclose or suggest a virtual machine having a two tier arrangement for threads support as claimed in claims 30 and 47.**

Appellant submits that *Nelson* and *Poole* do not disclose or suggest a virtual machine having a two tier arrangement for threads support that includes a threads interface layer that provides a standard threads interface and that further includes a native threads interface layer that adapts the standard threads interface to an underlying platform as claimed in claims 30 and 47. Instead, *Nelson* discloses programming tools for developing network

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<sup>1</sup> The Examiner has stated that Appellant cannot argue that the cited prior art does not disclose a virtual machine having the two-tier arrangement for threads support because claims 30-52 do not include the words "two tier arrangement." (Page 11, paragraph number 23, Office Action, 1/20/04). Appellant submits that the two tier arrangement is recited in claims 30-52 as a "threads interface layer" that provides a standard threads interface and a "native threads interface layer" for adapting the threads interface layer to an underlying platform. Appellant will use the term "two tier arrangement" for threads support as a shorthand way of referring to the two threads interface layers recited in claims 30-52.

management software for Java environments (*Nelson*, Abstract, lines 1-8)<sup>2</sup> and *Poole* discloses native function calling in a virtual machine. (*Poole*, Abstract, lines 1-4)<sup>3</sup>.

**B. *Nelson* and *Poole* do not disclose or suggest a virtual machine having a threads interface layer that provides a standard threads interface for a set of threads associated with an application program executed by the virtual machine such that the standard threads interface does not depend on an underlying platform of the virtual machine as claimed in claims 30 and 47.**

Appellant submits that *Nelson* and *Poole* do not disclose or suggest a virtual machine having a threads interface layer that provides a standard threads interface for a set of threads associated with an application program executed by the virtual machine such that the standard threads interface does not depend on an underlying platform of the virtual machine as claimed in claims 30 and 47. Instead, *Nelson* discloses threads support that does depend on an underlying platform (Solaris) of a virtual machine (*Nelson*, paragraph 0039, lines 15-23) and *Poole* does not disclose threads support at all.

For example, *Nelson* discloses a message protocol adapter (MPA) that enables communication between a management information server and a device agent (*Nelson*, paragraph 0033, lines 8-20) wherein the MPA includes

A Java Native Interface ("JNI") Layer 604 includes a library of C and/or C++ methods configured to define a Java Virtual Machine ("JVM") that provides translation of CMIS to Java.  
(*Nelson*, paragraph 0039, lines 15-18) ) (emphasis added) and states that the JNI layer 604

this layer also includes Solaris threads configured to provide additional support when the MPA is running in conjunction with the Solaris operating system (available commercially from Sun Microsystems...  
(*Nelson*, paragraph 0039, lines 19-22) (emphasis added). In contrast, a virtual machine according to claims 30 and 47 includes a standard threads interface

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<sup>2</sup> Appellant has found only one use of the word "threads" in the entire disclosure of *Nelson* and that use is in reference to threads support in an underlying operating system platform of a virtual machine and not in the virtual machine itself. (*Nelson*, paragraph 0039, lines 15-23).

that does not depend on the underlying operating system platform of a virtual machine.<sup>4</sup>

The Examiner has stated that a Java virtual machine as taught by *Nelson* includes a threads interface layer that does not depend on an underlying platform as claimed in claims 30 and 47 because a Java virtual machine allows the creation of platform-independent software.<sup>5</sup> (Pages 2-3, paragraph numbered 4, Office Action, 1/20/04). Appellant respectfully submits that platform-independent Java application programs are executed by a Java virtual machine. In contrast, the threads interface layer of claims 30 and 47 is part of a virtual machine.<sup>6</sup>

The Examiner has stated that *Poole* teaches "a virtual machine application<sup>7</sup>... associated with a threads interface without depending on the underlying platform" and then cites numerous sections of *Poole* that tout the advantages of platform independence provided by a virtual machine.<sup>8</sup> (Pages 3-4, Office Action, 1/20/04). Appellant respectfully submits, however, that none of the sections of *Poole* cited by the Examiner include a threads interface layer as claimed in claims 30 and 47.

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<sup>3</sup> Appellant has not found the word "threads" anywhere in the disclosure of *Poole*.

<sup>4</sup> The Examiner has stated that the threads support in the JNI layer 604 of *Nelson* does not depend on an underlying platform because *Nelson* teaches that the JNI layer 604 in one embodiment includes Solaris threads and therefore may not include Solaris threads in other embodiments. (Pages 10-11, paragraph numbered 22, Office action, 1/20/04). Appellant submits that removing Solaris threads from *Nelson* removes all of the teaching in *Nelson* that is relevant to threads support.

<sup>5</sup> The Examiner seems to be arguing that since application programs for a virtual machine are platform-independent then the threads support in the virtual machine itself should be platform independent even though *Nelson* discloses only threads support that is platform dependent.

<sup>6</sup> Appellant submits that the Examiner consistently fails to distinguish between a virtual machine and an application program for the virtual machine.

<sup>7</sup> It is unclear whether the term "virtual machine application" used by the Examiner refers to a virtual machine with a threads interface or to an application program with a threads interface.

<sup>8</sup> Again, the Examiner seems to be arguing that since application programs for a virtual machine are platform-independent then the threads support in the virtual machine itself should be platform independent even though *Poole* does not disclose threads support of any kind.



**C. *Nelson* and *Poole* do not disclose or suggest a virtual machine having a native threads interface layer that adapts a threads interface layer in the virtual machine to an underlying platform of the virtual machine as claimed in claims 30 and 47.**

Appellant submits that *Nelson* and *Poole* do not disclose or suggest a virtual machine having a native threads interface layer that adapts a threads interface layer in the virtual machine to an underlying platform of the virtual machine as claimed in claims 30 and 47. This follows from the fact that *Nelson* and *Poole* do not disclose or suggest a threads interface layer in a virtual machine that provides a standard threads interface that does not depend on an underlying platform of the virtual machine as claimed in claims 30 and 47.

**II: Claims 36 and 38-42 are not obvious in view of *Nelson* and *Poole* and *Delagi* because *Nelson* and *Poole* and *Delagi* do not disclose or suggest the limitations of claim 30.**

Appellant respectfully submits that claims 36 and 38-42, which depend from claim 30, are not obvious in view of *Nelson* and *Poole* and *Delagi* because *Nelson* and *Poole* and *Delagi* do not disclose or suggest a virtual machine having a two tier arrangement for threads support that includes a threads interface layer that provides a standard threads interface and that further includes a native threads interface layer that adapts the standard threads interface to an underlying platform as claimed in claim 30. Appellant has shown that *Nelson* and *Poole* do not disclose or suggest a virtual machine having threads support as claimed in claim 30. *Delagi* discloses multiprogramming hardware support in an underlying platform of a virtual machine (*Delagi*, col. 4, line 4 through col. 5, line 4) rather than a virtual machine having a two tier arrangement for threads support that includes a threads interface layer that provides a standard threads interface and a native threads interface layer that adapts the standard threads interface to an underlying platform as claimed in claim 30.

**III: Claim 37 is not obvious in view of *Nelson* and *Poole* and *Bucher* because *Nelson* and *Poole* and *Bucher* do not disclose or suggest the limitations of claim 30.**

Appellant respectfully submits that claim 37, which depends from claim 30, is not obvious in view of *Nelson* and *Poole* and *Bucher* because *Nelson* and *Poole* and *Bucher* do not disclose or suggest a virtual machine with a two-tier arrangement for threads support as claimed in claim 30. Appellant has shown that *Nelson* and *Poole* do not disclose or suggest a two-tier arrangement for threads support as claimed in claim 30. *Bucher* discloses data structures for storing thread context information (*Bucher*, col. 3, lines 29-35) for bus accesses to peripheral devices (*Bucher*, col. 4, line 66 through col. 5, line 47) rather than a two-tier arrangement for threads support as claimed in claim 30.

**IV: Claims 43-46 are not obvious in view of *Nelson* and *Poole* and *Farrell* because *Nelson* and *Poole* and *Farrell* do not disclose or suggest the limitations of claim 30.**

Appellant respectfully submits that claims 43-46, which depend from claim 30, are not obvious in view of *Nelson* and *Poole* and *Farrell* because *Nelson* and *Poole* and *Farrell* do not disclose or suggest a virtual machine having a two-tier arrangement for threads support as claimed in claim 30. Appellant has shown that *Nelson* and *Poole* do not disclose or suggest a virtual machine having a two-tier arrangement for threads support as claimed in claim 30.

*Farrell* does not disclose or suggest a virtual machine having a two-tier arrangement for threads support that includes a threads interface layer that provides a standard threads interface to application programs that does not depend on an underlying platform and that further includes a native threads interface layer that adapts the standard threads interface to an underlying platform as claimed in claim 30. Instead, *Farrell* discloses threads support that does depend on underlying platform of a virtual machine (*Farrell*, col. 3, lines 27-49). For example, Figure 1 of *Farrell* shows a set of application-callable threads support routines that are part of an operating system 10, i.e. an underlying platform of a virtual machine. (*Farrell*, col. 3, lines 43-46).


### CONCLUSION

Appellant respectfully submits that the stated rejections cannot be maintained in view of the arguments set forth above. Appellant respectfully submits that all of the claims 30-52 are patentable under 35 U.S.C. §103 over the references cited by the Examiner and requests that the Board of Patent Appeals and Interferences direct allowance of the rejected claims.

Respectfully submitted,

By

Date: 7-19-04

  
\_\_\_\_\_  
Paul H. Horstmann  
Reg. No. 36,167

## APPENDIX

30. A system for adapting threads support in a virtual machine to an underlying platform of the virtual machine, comprising:
- threads interface layer that provides a standard threads interface for a set of threads associated with an application program of the virtual machine such that the standard threads interface does not depend on the underlying platform;
  - native threads interface layer for adapting the threads interface layer to the underlying platform such that a set of routines in the threads interface layer use a set of routines in the native threads interface layer to support the threads.
31. The system of claim 30, wherein the native threads interface layer is adapted to an operating system of the underlying platform.
32. The system of claim 31, wherein the native threads interface layer is adapted to use a set of thread support routines provided by the operating system.
33. The system of claim 31, wherein the native threads interface layer is adapted to use a set of routines provided by the operating system that perform equivalent functions of functions in the native threads interface layer.
34. The system of claim 30, wherein the native threads interface layer is adapted to a hardware architecture of the underlying platform.
35. The system of claim 30, wherein the standard threads interface is a Java threads class.

36. The system of claim 30, wherein the routines in the threads interface layer maintain a set of context information for each thread in terms of the virtual machine.
37. The system of claim 30, wherein the routines in the native threads interface layer maintain a set of context information for each thread in terms of the underlying platform.
38. The system of claim 30, wherein the native threads support routines include a routine for suspending a particular thread.
39. The system of claim 30, wherein the native threads support routines include a routine for resuming a particular thread.
40. The system of claim 30, wherein the native threads support routines include a routine for waiting for completion of a particular thread.
41. The system of claim 30, wherein the native threads support routines include a routine for yielding execution to another thread.
42. The system of claim 30, wherein the native threads support routines include a routine for stopping execution of a particular thread and for cleaning up a set of strictures associated with the particular thread.
43. The system of claim 30, wherein the native threads support routines include a routine for setting a priority of a particular thread.
44. The system of claim 30, wherein the native threads support routines include a routine for obtaining a priority of a particular thread.

45. The system of claim 30, wherein the native threads support routines include a routine for obtaining an identifier of a currently executing thread.
46. The system of claim 30, wherein the native threads support routines include a routine for selecting a particular thread for execution.
47. A method for adapting threads support in a virtual machine to an underlying platform, comprising the steps of:  
    providing a threads interface layer having a standard threads interface in the virtual machine for a set of threads associated with an application program that executes under the virtual machine such that the standard threads interface does not depend on the underlying platform;  
    providing a native threads interface layer for adapting the threads interface layer to the underlying platform such that a set of routines in the threads interface layer use a set of routines in the native threads interface layer to support the threads.
48. The method of claim 47, wherein the step of providing a native threads interface layer includes the step of adapting the native threads interface layer to an operating system of the underlying platform.
49. The method of claim 48, wherein the step of adapting the native threads interface layer to an operating system includes the step of adapting the native threads interface layer to use a set of thread support routines provided by the operating system.
50. The method of claim 48, wherein the step of adapting the native threads interface layer to an operating system includes the step of adapting the native threads interface layer to use a set of routines provided by the



operating system that perform equivalent functions of functions in the native threads interface layer.

51. The method of claim 47, wherein the step of providing a native threads interface layer includes the step of adapting the native threads interface layer to a hardware architecture of the underlying platform.

52. The method of claim 47, wherein the step of providing a threads interface layer having a standard threads interface includes the step of providing a Java threads class.<sup>20</sup>